

BAYOU COCODRIE TMDL FOR TOTAL DISSOLVED SOLIDS (TDS)
SUBSEGMENTS 060201 AND 060202

US EPA Region 6

With cooperation from the
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EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify waterbodies that are not meeting water quality standards and to develop total maximum daily pollutant loads for those waterbodies. A total maximum daily load (TMDL) is the amount of a pollutant that a waterbody can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be distributed or allocated to point sources and nonpoint sources discharging to the waterbody. A TMDL has been developed for total dissolved solids (TDS) for Bayou Cocodrie.

Bayou Cocodrie, subsegment 060201, flows from US Highway 167 to the Bayou Boeuf – Cocodrie Diversion Canal (scenic). Subsegment 060202 flows from the Cocodrie Diversion Canal to its intersection with Bayou Boeuf. Subsegments 060201 and 060202 were not listed on the 1998 or October 28, 1999 Court Ordered §303(d) Lists. (LDEQ, 1998) However, based on subsequent data reviews by EPA, it was determined that these subsegments were not fully supporting the water quality standard for propagation of fish and wildlife and were ranked as high priority for TMDL development. Louisiana's water quality standards for chloride, sulfate, and TDS are applied as follows:

“Numerical criteria for these parameters generally represent the arithmetic mean of existing data from the nearest sampling location plus three standard deviations. For estuarine and coastal marine waters subsegments in Table 3 that have no listed criteria (i.e., designated N/A), criteria will be established on a case-by-case basis using field determination of ambient conditions and the designated uses. For water bodies not specifically listed in the Numerical Criteria and Designated Table, increases over background levels of chloride, sulfate, and TDS may be permitted. Such increases will be permitted at the discretion of the office on a case-by-case basis and shall not cause in-stream concentrations to exceed 250, 250, and 500 mg/l for chloride, sulfate, and TDS, respectively, except where a use attainability analysis indicates that higher levels will not affect the designated uses. In permitting such increases, the office shall consider their potential effects on resident biota and downstream water bodies in addition to the background conditions. Under no circumstances shall an allowed increase over background conditions cause any numerical criteria to be exceeded in any listed water body or any other general or numerical criteria to be exceeded in either listed or unlisted water bodies.”

LDEQ monitoring data was assessed for Bayou Cocodrie, subsegments 060201 and 060202 to determine if the propagation of fish and wildlife use was being maintained. Analysis of the data shows that the propagation of fish and wildlife use is not protected. Greater than 30% of the measurements exceeded the TDS criterion of 100mg/l (see Appendix A). Therefore, a TMDL has been developed for TDS.

For the purpose of calculating current TDS loading on segments 060201 and 060202 the average TDS concentration was calculated using monitoring data from LDEQ stations 0311 and 0103. In subsegments 060201 and 060202, average TDS concentrations were 96.22 mg/l and 88.70 mg/l over the collection periods April 5, 1995 to April 14, 1998 and February 14, 1995 to April 14, 1998, respectively.

For the purpose of TMDL development, the State criterion of 100 mg/l was applied. This TDS TMDL was developed based on simple dilution calculations using average flow and the state TDS standard of 100 mg/l. The TMDL calculation includes a wasteload allocation, a load allocation, and a margin of safety. A 0% reduction of TDS loading will be needed to meet the Louisiana TDS standard for the propagation of fish and wildlife. Although no load reduction will be required as a result of this TMDL, no increase in loads via point and/or non-point sources will be allowed until additional data clearly demonstrate that the criterion is not being exceeded in greater than 30% of the measurements.

1. Introduction

Bayou Cocodrie subsegments 060201 and 060202 were not listed on the 1998 or October 28, 1999 Court Ordered §303(d) Lists. However, based on subsequent data reviews by EPA, it was determined that these subsegments were not fully supporting the water quality standard for the propagation of fish and wildlife. A TMDL for total dissolved solids (TDS) was developed in accordance with the requirements of Section 303 of the federal Clean Water Act. The purpose of a TMDL is to determine the pollutant loading that a waterbody can assimilate without exceeding the water quality standard for that pollutant; the TMDL also establishes the load reduction that is necessary to meet the standard in a waterbody. The TMDL consists of the wasteload allocation (WLA), the load allocation (LA), and a margin of safety (MOS). The wasteload allocation is the load allocated to point sources for the pollutant of concern, and the load allocation is the load allocated to nonpoint sources. The margin of safety is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions, data inadequacies, and growth.

2. Study Area Description

2.1 Bayou Cocodrie, Subsegments 060201 and 060202

Bayou Cocodrie is located within segment 0602 in south central Louisiana. Bayou Cocodrie, subsegment 060201, flows from US Highway 167 to the Bayou Boeuf – Cocodrie Diversion Canal (scenic). Subsegment 060202 flows from the Cocodrie Diversion Canal to its intersection with Bayou Boeuf. The Red River is now leveed, eliminating the potential for a natural flow of water from the River into any of the streams in Segment 0602.

Land use is predominantly forestry and agriculture with the Alexandria urban area located to the north. Suburban communities have developed in the agricultural lands immediately south and west of Alexandria. The major land uses are listed in Table 1 (LDEQ, 1993).

Table 1. Land Use (acres) in Segment 0602: Vermilion-Teche Basin

SEGMENT	AGRICULTURE	URBAN	WETLAND	FOREST
0602	676,490 (64.1%)	46,942 (4.5%)	73,230 (6.9%)	245,115 (23.2%)

2.2 Water Quality Standards

The designated uses for Bayou Cocodrie include the propagation of fish and wildlife. TDS is a water quality criterion used for assessment of use support. Louisiana's water quality standard for TDS in subsegments 060201 and 060202 is 100 mg/l.

2.3 Identification of Sources

The sources identified in the *1998 Louisiana Water Quality Inventory* as affecting the water quality of Bayou Cocodrie are designated as “other” (natural sources) and “unknown” sources.

On subsegment 060202, additional suspected sources listed in the Court Ordered 1999 303(d) list include irrigated/non-irrigated crop production and hydromodification.

2.3.1 Point Sources

There is one permitted facility (with known flow information) discharging into Bayou Cocodrie and its tributaries. The flow of this discharge is approximately 118 million gallons per day (see Appendix B).

2.3.2 Nonpoint Sources

The predominant land uses along the Bayou Cocodrie are agriculture and forestry, both of which can contribute TDS loads through runoff. (LDEQ, 1993)

3. TMDL Load Calculations

3.1 Current Load Evaluation

TDS loads have been calculated using the instream TDS concentration and the flow of the stream. The following equation can be used to calculate TDS loads.

$$\text{Equation 1. } C \times Q \text{ in cfs} \times 5.39 \text{ or } C \times Q \text{ in MGD} \times 8.34$$

Where: C = concentration in mg/l and Q = stream flow in cfs or MGD

A traditional expression of the loading may be developed by setting one critical or representative flow and concentration, and calculating the TDS load using Equation 1. The difficulty with this approach is in the determination of the appropriate flow or concentration value to use.

For the purpose of calculating current loading on these subsegments; TDS concentration data from LDEQ water quality stations 0311 and 0103 were used. Station 0311 had an average instream TDS concentration of 96.22 mg/l with 6 of 19 data points exceeding 100 mg/l (April 5, 1995 – April 14, 1998) (see Appendix A). Station 0103 had an average instream TDS concentration of 88.70 mg/l with 6 of 20 data points exceeding 100 mg/l (February 14, 1995 – April 14, 1998) (see Appendix A). In addition, the average flow for Bayou Cocodrie (subsegments 060201 and 060202) is 236.76 ft³/sec (see Appendix C). For TMDL calculations, the average TDS concentration of 96.22 mg/l at station 0311 was used. Using these values and Equation 1, it is estimated that the current loading is:

$$\text{Current load} = 96.22 \text{ mg/l} \times 236.76 \text{ cfs} \times 5.39 = 122,789.84 \text{ lb/day}$$

3.2 TMDL

Point sources usually have a defined critical receiving stream low flow such as the 7Q10 (or Harmonic mean flow) at which the criterion must be met. For nonpoint sources it is recognized

that there may be no single critical flow condition. The load reduction needed to meet the water quality standard for propagation of fish and wildlife in Bayou Cocodrie at 236.76cfs is 0.00 lb/day (0.00% reduction). This was obtained by calculating the allowable TMDL at 236.76 cfs for the 100mg/L criterion (127,613.64 lb/day) and subtracting this load from the observed load (122,789.84 lb/day). However, since the observed load was less than the allowable load, no load reduction is required.

$$\text{TMDL} = \text{Cstd} \times Q \text{ cfs} \times 5.39, \quad \text{where Cstd} = 100 \text{ mg/l}, Q = 236.76 \text{ cfs}$$

$$\text{TMDL} = 100 \text{ mg/l} \times 236.76 \text{ cfs} \times 5.39 = 127,613.64 \text{ lb/day}$$

$$\text{Current Load} - \text{TMDL} = \text{Load Reduction}$$

$$122,789.84 \text{ lb/day} - 127,613.64 \text{ lb/day} = 0.00 \text{ lb/day}$$

Although no load reduction will be required as a result of this TMDL, no increase in loads via point and/or non-point sources will be allowed until additional data clearly demonstrate that the criterion is not being exceeded in greater than 30% of the measurements.

3.3 Wasteload Allocation (WLA)

The Louisiana Water Quality Regulations require permitted point source discharges of treated sanitary wastewater or cooling water to maintain in-stream TDS water quality standards of 100 mg/l on this subsegment. Therefore, there will be a need to include TDS limits in permit requirements based upon a wasteload allocation resulting from this TMDL unless it can be demonstrated that TDS is not present in discharger effluent.

Equation 1 can be used to calculate the total point source load (wasteload allocation) utilizing a TDS concentration of 100 mg/l and the design flow of the wastewater discharger (118 million gallons/day).

$$100 \text{ mg/l} \times Q \text{ in MGD} \times 8.34 = \text{WLA}$$

where Q is the discharge design flow from permitted facilities in subsegments 060201 and 060202 thus:

$$\text{WLA} = 98,412 \text{ lb/day}$$

3.4 Load Allocation (LA)

The load allocation for a given flow can be calculated using Equation 1 and the following relationship:

$$(\text{Current Load}) - (\text{WLA}) = \text{LA}$$

$$\text{LA for instream flow of } 236.76 \text{ cfs} = 24,377.84 \text{ lb/day}$$

$$122,789.84 \text{ lb/day (Current Load)} - 98,412 \text{ lb/day (WLA)} = 24,377.84 \text{ lb/day}$$

3.5 Seasonal Variability

Louisiana's water quality standard for TDS is for January through December. Therefore, no seasonal TMDL for TDS was developed.

3.6 Margin of Safety (MOS)

The Clean Water Act requires that TMDLs take into consideration a margin of safety. EPA guidance allows for the use of implicit or explicit expressions of the margin of safety or both. When conservative assumptions are used in the development of the TMDL or conservative factors are used in the calculations, the margin of safety is implicit. When a percentage of the load is factored into the TMDL calculation as a margin of safety, the margin of safety is explicit. In this TMDL for TDS, conservative assumptions have been used and therefore, the margin of safety is implicit. These conservative assumptions are:

- Using average flows to calculate current loading to obtain load reduction.
- Treating TDS as a conservative pollutant, that is, a pollutant that does not degrade in the environment.
- Using the TDS water quality standard of 100 mg/l rather than using site-specific criteria and seasonal variability factors.
- Using the design flow (where available) of the point source dischargers rather than actual average flow rates, which are typically much lower.

4. Other Relevant Information

Although not required by this TMDL, LDEQ utilizes funds under Section 106 of the federal Clean Water Act and under the authority of the Louisiana Environmental Quality Act to operate an established program for monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, to develop a long-term data base for water quality trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program is used to develop the state's biennial 305(b) report (*Water Quality Inventory*) (LDEQ, 1996) (LDEQ, 1998) and the 303(d) list of impaired waters. This information is also utilized in establishing priorities for the LDEQ nonpoint source program.

The LDEQ has implemented a watershed approach to surface water quality monitoring. Through this approach, the entire state is sampled over a five-year cycle with two targeted basins sampled each year. Long-term trend monitoring sites at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the five-year cycle. Sampling is conducted on a monthly basis or more frequently if necessary to yield at least 12 samples per site each year. Sampling sites are located where they are considered to be representative of the waterbody. Under the

current monitoring schedule, targeted basins follow the TMDL priorities. In this manner, the first TMDLs will have been established by the time the first priority basins are monitored again in the second five-year cycle. This will allow the LDEQ to determine whether there has been any improvement in water quality following establishment of the TMDLs. As the monitoring results are evaluated at the end of each year, waterbodies may be added to or removed from the 303(d) list. The sampling schedule for the first five-year cycle is shown below. The Vermilion-Teche River Basin will be sampled again in 2003.

1998 – Mermentau and Vermilion-Teche River Basins
1999 - Calcasieu and Ouachita River Basins
2000 – Barataria and Terrebonne Basins
2001 – Lake Pontchartrain Basin and Pearl River Basin
2002 – Red and Sabine River Basins

(Atchafalaya and Mississippi Rivers will be sampled continuously.)

In addition to ambient water quality sampling in the priority basins, the LDEQ has increased compliance monitoring in those basins, following the same schedule. Approximately 1,000 to 1,100 permitted facilities in the priority basins were targeted for inspections. The goal set by LDEQ was to inspect all of those facilities on the list and to sample 1/3 of the minors and 1/3 of the majors. During 1998, 476 compliance evaluation inspections and 165 compliance sampling inspections were conducted throughout the Mermentau and Vermilion-Teche River Basins.

5. Public Participation

When EPA establishes a TMDL, 40 C.F.R. § 130.7(d)(2) requires EPA to publicly notice and seek comment concerning the TMDL. Pursuant to an October 1, 1999, Court Order, EPA prepared this TMDL. After submission of this TMDL to the Court, EPA commenced preparation of a notice seeking comments, information and data from the general and affected public. Comments and additional information were submitted during the public comment period and this Court Ordered TMDL was revised accordingly. EPA has transmitted this revised TMDL to the Court, and to the Louisiana Department of Environmental Quality (LDEQ) for incorporation into LDEQ's current water quality management plan.

REFERENCES

- LDEQ, 1993. Louisiana Department of Environmental Quality. *State of Louisiana Water Quality Management Plan, Volume 6, Part A: Nonpoint Source Pollution Assessment Report*. Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge, La.
- LDEQ, 1996. *State of Louisiana Water Quality Management Plan, Volume 5, Part B: Water Quality Inventory*. Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge, La.
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- LDEQ, 2001. <http://www.deq.state.la.us/surveillance/wqdata/0103wqng.txt>
- LDEQ, 2001. <http://www.deq.state.la.us/surveillance/wqdata/0311wqng.txt>

APPENDIX A Total Dissolved Solids (TDS) data.

All total dissolved solids data collected at Bayou Cocodrie over the specified period of record can be found on the Louisiana Department of Environmental Quality's web site at:

<http://www.deq.state.la.us/surveillance/wqdata/0103wqng.txt>.

and

<http://www.deq.state.la.us/surveillance/wqdata/0311wqng.txt>.

Bayou Cocodrie at St. Landry, Louisiana, Station 0103

This page last updated on: 08/06/00

DATE	TIME	DEPTH meters	ALKA- LINITY mg/l	HARD- NESS mg/l	TURB- IDITY NTU	COLOR PT-CO units	CHLOR- IDES mg/l	SULFATE mg/l	T.S.S. mg/l	T.D.S. mg/l	T.S. mg/l
12/08/98	0945	1.0	19.6	19.5	12.0	.	6.6	1.9	22.7	.	.
11/23/98	1215	1.0	15.1	14.3	13.0	.	6.8	2.1	17.0	.	.
11/09/98	0920	1.0	19.8	18.9	6.6	.	5.8	1.6	K 4.0	.	.
10/27/98	0943	1.0	21.3	20.9	9.3	.	5.5	2.6	11.0	.	.
10/13/98	0930	1.0	18.7	20.3	9.2	.	6.2	2.4	15.0	.	.
09/22/98	0940	1.0	.	.	15.0	.	4.1	5.0	18.0	.	.
09/08/98	0915	1.0	.	.	11.0	.	6.7	1.8	9.2	.	.
08/25/98	0945	1.0	.	.	11.0	.	6.7	2.0	14.0	.	.
08/11/98	1026	1.0	.	.	10.0	.	6.9	1.8	15.0	.	.
07/28/98	1022	1.0	.	.	.	.	6.0	.	.	.	.
07/14/98	0845	1.0	.	.	13.0	.	6.0	K 1.3	19.0	.	.
06/23/98	1007	1.0	.	.	7.8	.	6.3	1.4	5.0	.	.
04/14/98	1003	.8	17.7	14.8	17.0	50.0	9.4	K 1.3	10.0	84.1	.
02/10/98	1047	1.0	11.2	10.9	22.0	70.0	2.7	2.9	15.0	70.0	.
12/09/97	0934	1.0	15.7	17.5	26.0	60.0	4.8	4.4	10.0	114.0	.
10/14/97	0925	.5	18.3	12.1	7.8	30.0	5.9	2.4	9.9	45.9	.
08/12/97	0930	.7	17.9	12.8	11.0	40.0	4.8	1.4	14.0	116.0	.
06/10/97	0940	1.0	20.7	19.3	31.0	70.0	4.4	2.5	18.0	134.0	.
04/15/97	0900	1.0	17.0	13.0	14.0	40.0	4.7	1.7	K 4.0	90.0	.
02/18/97	0917	1.0	11.8	11.9	55.0	70.0	2.4	2.7	13.5	88.0	.
12/10/96	0920	1.0	15.0	13.3	5.9	60.0	5.7	1.9	7.5	80.0	.
10/15/96	0930	1.0	15.0	13.5	10.0	100.0	3.2	1.2	7.3	83.9	.
08/13/96	1015	1.0	124.0	150.0	7.0	60.0	30.9	16.2	10.0	216.0	.
06/11/96	0940	1.0	30.3	15.3	6.8	60.0	4.6	1.5	17.0	74.0	.
04/09/96	1030	1.0	26.2	19.6	7.2	40.0	6.6	2.2	8.0	8.0	.
02/13/96	0938	1.0	15.3	14.2	24.0	70.0	4.1	3.0	71.0	112.0	.
12/12/95	1005	1.0	17.2	13.9	6.0	60.0	8.4	2.2	K 4.0	62.0	.
10/10/95	0932	1.0	16.5	14.0	12.0	60.0	4.8	2.2	9.0	78.0	.
08/15/95	0940	1.0	23.1	16.0	12.0	50.0	4.2	K .0	24.0	64.0	.
06/13/95	1010	1.0	17.9	14.4	15.0	30.0	3.6	1.4	29.3	64.1	.
04/05/95	0938	1.0	16.0	13.9	15.0	60.0	3.3	2.1	103.0	76.0	.
02/14/95	0940	1.0	12.0	31.0	24.0	50.0	3.2	2.3	5.0	114.0	.

The TDS criterion (100mg/l) was exceeded in 30% of the samples (6 out of 20 samples) from February 1995 to April 1998.

Bayou Cocodrie northeast of Oakdale, Louisiana, Station 0311

This page last updated on: 08/06/00

DATE	TIME	DEPTH meters	ALKA- LINITY mg/l	HARD- NESS mg/l	TURB- IDITY NTU	COLOR PT-CO units	CHLOR- IDES mg/l	SULFATE mg/l	T.S.S. mg/l	T.D.S. mg/l	T.S. mg/l
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04/14/98	1114	1.0	14.1	10.6	9.0	40.0	3.4	K 1.3	K 4.0	206.0	.
02/10/98	1143	1.0	9.2	8.1	16.0	50.0	2.2	2.1	11.0	70.0	.
12/09/97	1051	1.0	8.1	9.4	16.0	70.0	4.2	3.5	K 4.0	98.1	.
10/14/97	1034	.7	17.2	9.8	13.0	30.0	5.5	1.3	18.0	142.0	.
08/12/97	1051	1.0	14.0	8.0	5.0	40.0	4.8	1.2	6.0	138.0	.
06/10/97	1115	1.0	13.6	10.0	6.8	60.0	3.6	1.6	9.0	76.0	.
04/15/97	1005	1.0	12.2	8.2	10.0	20.0	5.9	1.7	4.0	70.0	.
02/18/97	1045	1.0	7.5	7.7	25.0	60.0	3.1	2.4	8.0	69.9	.
12/10/96	1045	1.0	14.9	13.8	6.0	60.0	5.1	1.9	6.5	44.0	.
10/15/96	1043	1.0	13.6	12.3	6.5	100.0	4.2	1.1	5.0	92.0	.
08/13/96	1045	1.0	15.4	9.2	2.5	60.0	5.1	1.7	3.0	136.0	.
06/11/96	1050	1.0	19.3	9.6	3.4	60.0	4.5	1.7	11.0	170.0	.
04/09/96	0920	1.0	16.4	12.4	4.0	50.0	5.9	1.7	9.0	48.0	.
02/13/96	1045	1.0	11.4	11.9	18.0	60.0	4.0	2.6	6.0	70.0	.
12/12/95	1043	1.0	13.0	9.7	3.5	60.0	6.3	1.8	K 4.0	114.0	.
10/10/95	1050	1.0	12.9	10.7	10.0	60.0	4.4	2.8	30.0	84.0	.
08/15/95	1050	1.0	16.4	10.0	5.0	50.0	4.0	K .0	12.0	64.0	.
06/13/95	1045	1.0	13.6	12.3	6.0	50.0	3.8	1.5	10.0	60.1	.
04/05/95	1100	1.0	12.0	11.7	8.2	60.0	2.8	1.8	1.0	76.0	.
02/14/95	1050	1.0	.	.	.	.	.	.	.	.	.

The TDS criterion (100mg/l) was exceeded in 32% of the samples (6 out of 19 samples) from April 1995 to April 1998.

APPENDIX B Dischargers in subsegment.

Dischargers to Bayou Cocodrie			
Facility	Permit #	Receiving Water	Design Flow
			MGD
Cleco Coughlin power station	LA0002879	Bayou Cocodrie	118

APPENDIX C Flow Information

Average stream flow was calculated based on the runoff for USGS station on Bayou Courtableau near Washington, LA with a runoff rate of 1.56 cfs per square mile and a total drainage area of 151.77 square miles. The total drainage area represents the drainage area for each subsegment. Subsegment 060201 has a drainage area of 81.76 square miles and subsegment 060202 has a drainage area of 70.01 square miles. The average stream flow was calculated to be 236.76 cfs.